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Characterization of a well performing and durable Ni:CGO-infiltrated anode for metal-supported SOFC

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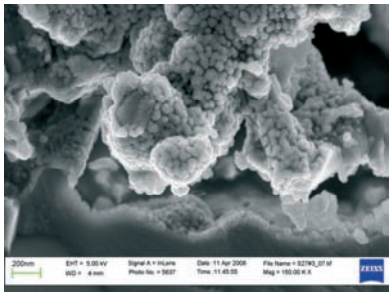
A novel anode for metal supported solid oxide fuel cells (SOFCs) based on infiltration of Ni:CGO nano-sized particles on a metal based backbone was recently demonstrated on single cell level to show excellent performance and durability [1]. A degradation rate of 0.9 % pr. 1000 hours during in total 3000 hours of 0.25A/cm^2 galvanostatic testing at 650 ºC was shown. Furthermore, it was shown on button cells that if the cathode side consisted of a dense CGO barrier layer in combination with a LSC cathode, a performance with an area specific resistance (ASR) of 0.27 Ωcm^2 at 650 ºC could be obtained. These performance and durability characteristics are very encouraging but despite several papers on metal supported SOFC with this type of infiltrated anode [1-3], the performance and the factors controlling the performance and durability is not yet well understood. Only some initial data on symmetrical cells with Ni:CGO infiltrated metal based cermet anode with respect to temperature and water dependency has been reported [2-3]. Fig. 1 shows a Scanning Electron Microscopy (SEM) image of the infiltrated Ni:CGO nano particles.



Figur 1 SEM image of fractured infiltrated anode.

In the present paper we report a more detailed impedance characterization of the metal based anode with Ni:CGO infiltration by e.g. studying the influence of Ni content and impedance development during initial startup. Secondly, the effect of start-up temperature on the performance of the Ni:CGO infiltrated anode is studied. Finally, all previous reports with this type of anode have been performed with very low fuel utilization (FU). In the context of metal supported SOFC it is inherently interesting to study the technological relevant situation of high FU, as the tolerance towards corrosion, and the impact of corrosion on performance and durability, is critical. Therefore, the impact of high steam content in the fuel and hence corrosion of the metal based backbone is studied and characterized.

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